CLAIMS

1. An optical fiber having on an end thereof an optically diffractive film, the optical fiber characterized in that:

the diffractive film includes a transparent DLC layer formed onto an endface of the optical fiber, or onto an endface of a collimator joined to the endface of the optical fiber; and

the DLC layer includes a diffraction grating containing local regions of relatively high refractive index and local regions of relatively low refractive index.

2. The optical fiber set forth in claim 1, characterized in that the diffractive film allows a single optical beam including a plurality of wavelengths to be split into a plurality of beams depending on the wavelength, and functions as a wavelength-division multiplexer/demultiplexer that can cause a plurality of beams having different wavelengths to combine into a unitary optical beam.

3. The optical fiber set forth in claim 1, characterized in that the diffractive film allows a single-wavelength optical beam to be split into a plurality of beams, and functions as a power splitter/combiner that can cause a plurality of single-wavelength beams to combine into a unitary optical beam.

4. The optical fiber set forth in claim 1, characterized in that the diffractive film has polarization-division multiplexer/demultiplexer functionality that can separate, and cause to unite, TE waves and TM waves

contained in a single-wavelength optical beam.

5. The optical fiber set forth in claim 1, characterized in that the diffractive film has wave-plate functionality with respect to either TE waves or TM waves contained in a single-wavelength optical beam.

6. An optical fiber having on an end thereof an optically diffractive film, the optical fiber characterized in that:

the diffractive film includes a first transparent DLC layer and a second transparent DLC layer laminated in turn onto an endface of the optical fiber, or onto an endface of a collimator joined to the endface of the optical fiber;

the first and second DLC layers each include a diffraction grating containing local regions of relatively high refractive index and local regions of relatively low refractive index;

the first DLC layer has polarization-division demultiplexing functionality that can split by polarization TE waves and TM waves contained in a single-wavelength optical beam;

the second DLC layer has wave-plate functionality with respect to either TE waves or TM waves contained in a single-wavelength optical beam; and

the first and second DLC layers function interactively as an optical isolator.

7. The optical fiber set forth in claim 6, characterized in that the diffractive film is formed onto the endface of the optical fiber, and has a thickness of 20 μm or less.

8. The optical fiber set forth in claim 7, characterized in that the optical

fiber end portion onto which the diffractive film is formed is retained in a connector for abutting the fiber end portion against and connecting it to an endface of another optical fiber.

9. The optical fiber set forth in any of claims 6 through 8, characterized in that a transparent interlayer is inserted in between the first DLC layer and the second DLC layer.

10. The optical fiber set forth in any of claims 1 through 9, characterized in that the diffractive film includes the diffraction grating being functional with respect to light containing wavelengths within a range of from 0.8 μm to 2.0 μm.

11. A method of manufacturing the optical fiber set forth in any of claims 1 through 10, the optical-fiber manufacturing method characterized in that the high refractive-index regions contained in the diffraction grating(s) are formed by irradiating the DLC layer(s) in a predetermined pattern with an energy beam to raise the refractive index of the layer(s).

12. A method of manufacturing the optical fiber set forth in claim 9, the optical-fiber manufacturing method characterized in:

depositing the first DLC layer onto the endface of the optical fiber, or onto the endface of the collimator joined to the endface of the optical fiber;

forming said high-refractive index regions in the first DLC layer by irradiating it with an energy beam to raise its refractive index in a first predetermined pattern;

depositing the transparent interlayer and the second DLC layer in turn; and

forming said high-refractive index regions in the second DLC layer by irradiating it with an energy beam to raise its refractive index in a second predetermined pattern; wherein

when the second DLC layer is being irradiated in the second predetermined pattern with an energy beam, the transparent interlayer acts to prevent the energy beam from having an effect on the first DLC layer.

13. The optical-fiber manufacturing method set forth in claim 11 or 12, characterized in that the energy beam is selected from an X-ray beam, an electron beam, or an ion beam.

14. The optical-fiber manufacturing method set forth in any of claims 11 through 13, characterized in that the DLC layer(s) are deposited by a plasma CVD technique.